Weekly Report

2018.0604-2018.0610

1.This Week

Power Grid Deep Learning Paper
1.learn to use keras with tensorflow framework to run deep learning models on the work station
2.Look for other potential models to solve the fault location problem.
3.Re-evaluate the paper idea during the searching process of appropriate models:

The original idea of the paper is to (1) locate the fault and (2) analyze the propagation of the fault.
The result is, the study of problem (1) is weak as compared to existing works unless we can dig out particular directions of this problem. And this particular direction could be:
IDEA (A): to locate a fault with incomplete monitoring data which can very likely happen in real cases.
As for problem (2), our former work is too general to focus on a point of this problem. As a result, I want to propose a more specific point of problem (2):
IDEA (B): to identify the main propagation routes when a fault is triggered.

Approach to solve both IDEA (A) and (B): can be topic models.
For IDEA (A), we get a bundle of sub-spaces of the multi-dimensional data space. Each sub-space can be analogy to a document and temporal values of each variable of each node can be analogy to words. The goal is to find the most probable topic and description word in this topic to describe the documents. And the problem is: this highly depends on the frequency of the documents containing the fault location.

For IDEA (B), we have a bundle of simulation samples. Each sample can be analogy to a document. But the nodes in each sample are all the same, making our documents all the same if nodes are treated as words. One way to solve this problem is to divide the simulation time period into time windows and regard each time windows of a node as a word. Each extracted topic with words in it can be sorted according to the time order and therefore form a propagation route. In this way, temporal information in each sample is considered and the condition of propagation back is also considered.

I’ll discuss these two ideas on the Monday morning meeting.

Others

1.write the course paper and the project of the human-computer interaction course
2.carefully go through the Chinavis paper to be reviewed

Paper Reading

1. **A Markov-Transition Model for Cascading Failures in Power Grids （IEEE HICSS）**

I learned the following two points in this paper:
(1)Graphic analysis approaches cannot be directly applied to a power grid network because of unswitchable distribution routes and node characteristics.
(2)It is valuable to study the evolution process of cascading failures with regard to time.
As a result, this paper proposes a stochastic cascading model based on conditional Markov transition and presents experimental results. Drawbacks include:
(1)Stochastic model is not the most appropriate one if we have history data on which we can make deductions.
(2)This paper contributes to involve the evolution process of cascading failures in the mathematical model, but not interactive analysis.

2. **A Two-Level Probabilistic Risk Assessment of Cascading Outages (IEEE transactions on power grids)**

This paper decompose cascading failures into two levels: a “slow cascade” and a “fast cascade”. The risks of both levels are fairly assessed. For the slow cascade, only unstable conditions will be assesses as dangerous. As for the fast cascade, Dynamic Event Trees (DET) is applied to construct the failure evolution process. Scenarios of the first level are clustered and the Manchester model is used to assess the restoration.

3. **Risk Assessment of Multi-timescale Cascading Outages based on Markovian Tree Search (IEEE transactions on power grids)**

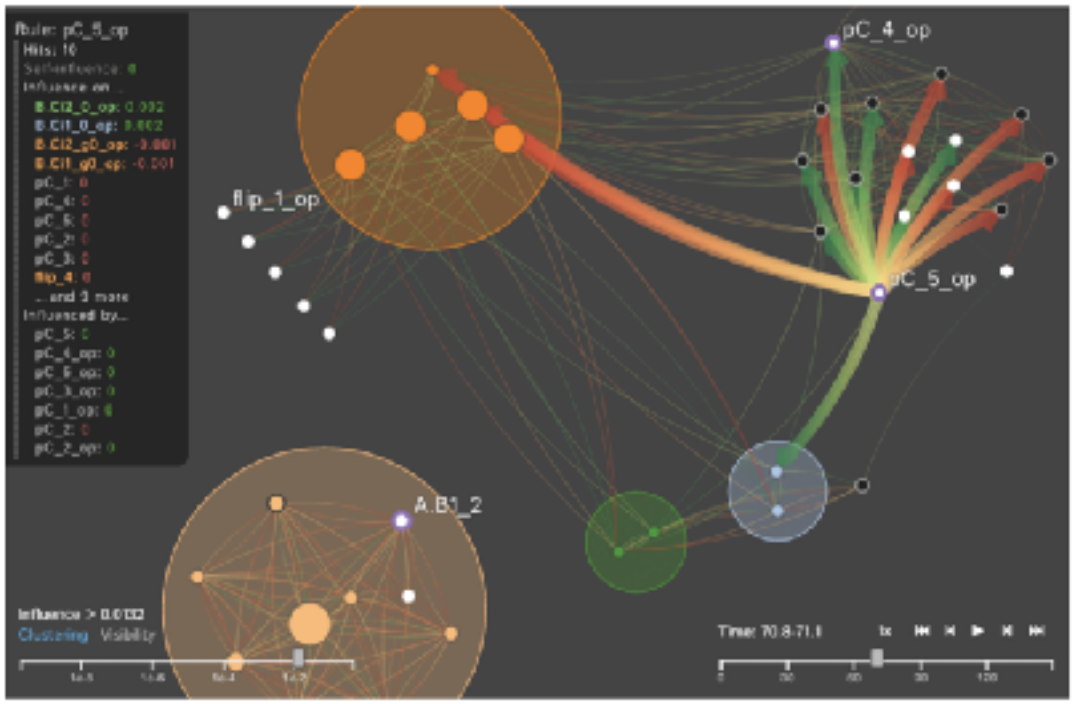
This paper formulates the dynamic failure evolution process as a Markovian tree model, allowing a multi-timescale simulation. The risk is assessed by path searching on Markovian tree and accelerated by a risk estimation index used to guide the search for states with major contributions to the risk.

This paper as well as the former paper reminds me of that: the failure evolution process can be more like a graph structure rather than a tree structure (as modeled by DET and Markovian tree in these two papers). Because the failure might very likely propagate back to the starting point if no security measures are taken.

4. **Dynamic Influence Networks for Rule-based Models**

This paper analyzes the evolution process of influence between biological rules, which can be regarded as a propagation process. The core of this paper is to construct the directed graph of the influence network based on all of the original data and depict the evolution by animation.

This is a little bit different from what we what to do (IDEA (B): to identify the main propagation routes when a fault is triggered.). Since this paper aims to construct the entire graph but we want to extract routes in the entire graph.



5. PhenoLines: Phenotype Comparison Visualizations for Disease Subtyping via Topic Models

This paper extract topics from clinical record data via topic model. The extracted topics are disease subtypes. It focuses on interpreting the out put of the selected topic model by processing its output into a graph-based abstraction which considers both hierarchical and temporal aspects. And a measure of relevance is developed to simplify the graph topology. To interpret the evolution, topics are extracted at every sampled time step. This could be the most common way to characterize the evolution of topics, but it is hard to extract an evolution route through the words in topics. As a result, I am thinking if we do it in another way (split the entire time period into time windows and apply topic models on these time segments), then words in the same topic may very likely to form an evolution route.

2.Progress

Work	Deadline	Progress
Power grid paper with Deeping learning	-	Idea is re-evaluated.
SQC Paper	-	About to started.